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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/812,117

03/29/2004

Richard L. Elliott

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7596

24247 7590 03/21/2007  
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EXAMINER

POMPEY, RON EVERETT

ART UNIT

PAPER NUMBER

2812

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

03/21/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/812,117	ELLIOTT ET AL.	
	Examiner	Art Unit	
	Ron E. Pompey	2812	

– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 20 November 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1,5-8 and 11-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12-21 is/are allowed.
- 6) ☒ Claim(s) 1,5-8 and 11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date. _____   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 6 and 11 rejected under 35 U.S.C. 103(a) as being unpatentable over Gofuku (US 6,190,911) in view of H. Sauer et al. (US 3451871).

Regarding claim 1, Gofuku discloses forming an insulation layer (110/112) on a semiconductor substrate, forming a contact hole in the insulation layer to expose a contact surface on the substrate, and forming a single layer of metal (113) having a substantially planar top surface upon a top planar surface of the insulation layer (the portion of the insulation layer that is covered by the single layer of metal has a top planar surface), the single layer of metal substantially tilling the contact hole and in physical contact with the contact surface on the substrate (Fig. 3K; col. 4, ln. 50 - col. 6, ln. 3).

the single layer of metal may include aluminum (col. 4, ln. 40-44).

Regarding claim 6, Gofuku discloses that the insulation layer may be made of silicon dioxide (col. 5, ln. 31-36, ln. 57-62).

Regarding claim 11, Gofuku discloses that the single layer of metal is deposited by a PVD process (sputtering) (col. 5, ln. 63-67).

Gofuku, as indicated above, discloses all the features of the claims except:

wherein the single layer of metal comprises a material selected from the group consisting of AlAg, AlAu, AlMn, AlNa, AlW, AlCuZn, and AlNi.

a. However, Sauer discloses:

wherein the single layer of metal comprises a material selected from the group consisting of AlAg, AlAu, AlMn, AlNa, AlW, AlCuZn, and AlNi (col. 5, ln. 45-52).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the metal in Gofuku, with the AlMn material as taught by Sauer, because it is a good conductor.

2. Claims 1, 5 and 6 rejected under 35 U.S.C. 103(a) as being unpatentable over by McAnally et al. (US 5,960,304) in view of H. Sauer et al. (US 3451871).

Regarding claim 1, McAnally discloses forming an insulation layer (16) on a semiconductor substrate (12), forming a contact hole in the insulation layer to expose a contact surface on the substrate, and forming a single layer of metal (24) having a substantially planar top surface upon a top planar surface of the insulation layer, the single layer of metal substantially filling the contact hole and in physical contact with the contact surface on the substrate (Fig. 1A-1F, col. 2, ln. 43 - col. 4, ln. 22).

Regarding claim 5, McAnally discloses that the insulation layer may be made of BPSG (col. 3, ln. 6-7).

Regarding claim 6, McAnally discloses that the insulation layer may be made of an oxide (col. 3, ln. 6-7).

McNally, as indicated above, discloses all the features of the claims except:

wherein the single layer of metal comprises a material selected from the group consisting of AlAg, AlAu, AlMn, AlNa, AlW, AlCuZn, and AlNi.

b. However, Sauer discloses:

wherein the single layer of metal comprises a material selected from the group consisting of AlAg, AlAu, AlMn, AlNa, AlW, AlCuZn, and AlNi (col. 5, ln. 45-52).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the metal in Gofuku, with the AlMn material as taught by Sauer, because it is a good conductor.

3. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gofuku (US 6,190,911) in view of H. Sauer et al. (US 3451871) in further view of Lee et al. (US 5,355,020, previously cited) and Sahota (US 5,840,623, previously cited).

Regarding claim 7, Gofuku discloses forming a metal line having a thickness and a selected shape from the single layer of metal, but Gofuku does not disclose planarizing the insulation layer and the single layer of metal. Like Gofuku, Lee discloses forming a metal connection made by depositing an aluminum alloy metal layer into a contact opening in an insulation layer. Lee teaches that the aluminum alloy metal layer should be treated in an environment of a selected pressure range and a selected temperature range so as to cause the single layer of metal to substantially fill the contact hole without forming a void in the metal connection layer (Abstract; col. 10, ln. 57 - col. 11, ln. 62; col. 14, ln. 39 - col. 16, ln. 16). At the time of the invention, it would have been obvious to one of ordinary skill in the art to heat treat the single layer of metal of Gofuku because Lee teaches that by annealing the metal layer, the connection

can be formed without a void. Like Gofuku, Sahota discloses forming metallization interconnect structures in an insulation layers. Sahota discloses that it is conventional in the art to planarize the surface of the insulation layer (col. 1, ln. 6-36). At the time of the invention, it would have been obvious to one of ordinary skill in the art to planarize the insulation layer of Gofuku in order to prevent photolithography errors when patterning the contact hole and metal connection.

Regarding claim 8, Gofuku discloses patterning and etching the single layer of metal into the metal line having the selected shape (col. 5, ln. 63-67).

#### ***Response to Arguments***

4. Applicant's arguments with respect to claims 1, 5-8 and 11 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Allowable Subject Matter***

Claims 12-21 are allowed.

The primary reasons for the allowance of claims 12-21 were stated in the office action mailed December 1, 2005.

#### ***Conclusion***

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

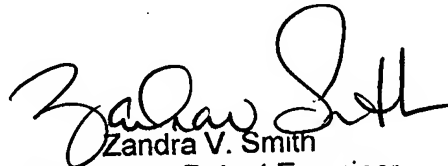
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ron E. Pompey whose telephone number is (571) 272-1680. The examiner can normally be reached on 9AM - 5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2812

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Ron Pompey  
AU: 2812  
3/19/07

  
Zandra V. Smith  
Supervisory Patent Examiner  
19 March 2007